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Future Railcar Needs for U.S. Grain Movements

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FUTURE RAILCAR NEEDS FOR U. S. GRAIN MOVEMENTS

U. S. DEPARTMENT OF AGRICULTURE

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FUTURE RAILCAR NEEDS FOR U.S. GRAIN MOVEMENTS

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INTRODUCTION

Increasing domestic and foreign demand for U.S. grains means larger off-farm movements in future years. Whether or not railroads maintain their share of future U.S. grain movements depends largely on the railcar supply available to meet the projected demand for grain transportation. To keep up with this demand, additional transportation equipment or substantially improved utilization of present equipment, or both, will be needed to move U.S. grains to markets during the next few decades.

At the present time, grain shippers are facing one of the worst railcar shortages in the nation's history. Railroads know that car shortages often mean lost sales. On the other hand, too many cars in a fleet would prohibit an adequate return on investment. The correct number of cars combined with efficient utilization is necessary to insure that the railroads remain viable and capable of providing adequate service to grain shippers in the future.

The purpose of this study is to project the demand for grain transportation during the years 1985, 1990, and 2000. This projection can guide U.S. railroads in planning adequate railcar fleets for grain movement during these future periods. Railroads and shippers must work together to improve car utilization insuring sounder financial viability for our railroads.

FUTURE GRAIN TRANSPORTATION DEMAND

Grain sold off the farm is expected to reach 289 million tons by 1985 and 334 million tons by 1990 (table 1). This is an increase of 32 and 76 million tons, respectively, over the 1977/78 crop year when considerable railcar shortages existed (table 2). By the year 2000, grain sold off the farm is expected to reach 414 million tons or 156 million tons over 1977/78 grain movements.

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Table 1--Projections of transportation demand for all major grains sold off farms

Grains	1985	1990	2000
	<u>Million tons</u>		
<u>Sold off farm</u>			
Feed grains	165.2	186.9	224.9
Food grains	65.9	76.6	95.3
Soybeans	58.2	70.2	93.4
Total	289.3	333.7	413.6
<u>Moved domestically</u>			
Feed grains	110.2	119.4	142.8
Food grains	26.6	28.0	30.5
Soybeans	32.6	38.3	50.3
Total	169.4	185.7	223.6
<u>Moved exports</u>			
Feed grains	55.0	67.5	82.1
Food grains	39.3	48.6	64.8
Soybeans	25.6	31.9	43.1
Total	119.9	148.0	190.0

Source: National Economic Analysis Division of the Economics, Statistics, and Cooperatives Service, U.S. Department of Agriculture. The amount sold off farm computed from preliminary projections as of July 1978 from above source. See appendix for assumption.

Table 2--Current transportation demand for all major U.S. grains sold off farms

Grains	1975/76*	1976/77	1977/78
	<u>Million tons</u>		
<u>Total demand</u>			
Feed grains	130.2	138.6	144.3
Food grains	67.0	67.0	63.0
Soybeans	45.0	37.9	50.4
Total	242.7	243.5	257.7
<u>Moved domestically</u>			
Feed grains	75.1	82.8	87.4
Food grains	29.0	35.2	26.6
Soybeans	28.9	21.0	32.1
Total	133.0	139.0	146.1
<u>Moved exports</u>			
Feed grains	55.1	55.8	56.9
Food grains	38.0	31.8	36.4
Soybeans	16.6	16.9	18.3
Total	109.7	104.5	111.6

Source: "Agricultural Outlook," January-February 1978, Economics, Statistics, and Cooperatives Service, U.S. Department of Agriculture.

*Marketing year periods:

June 1 to May 30, for wheat, oats, rye and barley
 October 1 to September 30, for corn and grain sorghums
 September 1 to August 31, for soybeans

Much of the projected increase moving off U.S. grain farms results from more domestic feed grain movement (corn, sorghum, barley, and oats) during these future periods. By 1985, domestic movements of feed grains are expected to increase by an additional 23 million tons over the 1977/78 marketing year. By 1990, this increase is expected to reach 32 million tons and by the year 2000, 55 million tons.

Domestic movements of food grains (wheat, rice, rye, and soybeans) are not expected to show much change by 1985. However, food grains and soybeans will show substantial increases during the later projected years. Total grain exports will continue to expand grain transport demand during the years 1985, 1990, and 2000.

Grain movements by barge have substantially increased in recent years. However, constraints on the Mississippi River by Locks and Dam No. 26 could restrict continued expansion of water movement until this lock is rehabilitated. Also, levels of waterway user charges pending on current congressional legislation could limit future grain movements on inland waterways.

Higher fuel cost, however, could restrict long-haul grain movements by truck and would emphasize the higher fuel efficiency of rail. This would increase the importance of the railroads as grain haulers in the future. Because of these imminent restrictions on barges and trucks, it is assumed that railroads will at least maintain their present modal share percentage of grain transportation until the year 2000.

RAILROADS' SHARE OF GRAIN MOVEMENT

Rails' share of the total U.S. grain movement is estimated to reach 116 million tons by 1985 (table 3). This is a 12-million-ton increase over the 1977/78 market season when severe grain car shortages prevailed. Much of this increase, over 8 million tons, is due to increased feed grain movement.

Table 3--Railroads' share of current and future U.S. grains sold off farms

	1975/76	1976/77	1977/78
	<u>Million tons</u>		
Feed grains	48.4	51.5	53.7
Food grains	42.1	42.1	39.6
Soybeans	10.6	8.8	11.6
Total	101.1	102.4	104.9
	1985	1990	2000
Feed grains	61.4	69.5	83.7
Food grains	41.4	48.1	59.8
Soybeans	13.5	16.3	21.7
Total	116.3	133.9	165.2

Source: Computed from table data - See appendix for assumptions included in railroads' share of grains sold off farms.

By 1990, railroads' modal share of total U.S. grains sold off farms is expected to reach 134 million tons and 165 million tons by the year 2000. These are increases of about 29 and 60 million tons over the 1977/78 market season, and point out the future need of a larger covered hopper supply in the future.

Feed grains account for much of railroads' share of increased tonnage projected for the years 1990 and 2000, up 16 and 30 million tons, respectively, over the 1977/78 marketing year. Food grains show smaller gains, up 8 and 20 million tons, respectively, during the same time period. Soybeans are also expected to be up an additional 5 and 10 million tons respectively during this time.

These projections show that railroads are facing a growing transportation demand for grains in future years.

TRENDS IN TRIPS PER CAR PER YEAR

During recent years, railcar use has been declining. In 1968, all types of cars averaged 19.5 trips per year. By 1977, this average had fallen to 16.5 trips per year. Covered hopper cars made 17.2 trips in 1968, and by 1977, their average had fallen to 15.2 trips per year (table 4).

Table 4--Trips per year by car type

Year	Narrow door boxcar	Covered hopper
1972	14.1	17.6
1973	15.2	17.2
1974	13.3	16.3
1975	9.9	15.2
1976	9.2	15.7
1977	9.4	15.2

Source: Association of American Railroads, CS-54-1B, Annual summary reports for respective years.

Some of the major reasons for reduction in the number of trips per year for covered hopper cars in 1977 were unusually cold winters with heavy snow, poor locomotive maintenance and an increase in unserviceable cars.

Because of the difficulty in predicting future covered hopper trips per year, six scenarios were considered. The first scenario considers a railcar operational level of 15 trips per year; the second through six are for 16 trips, continuing on to 20 trips per year.

Railroads should know their own operational levels best in terms of car trips per year. Therefore, they can select which scenario best reflects their covered hopper operational level for grain movement for the projected years 1985, 1990, and 2000.

The results of the assumed scenarios are shown in the section on Railcars Required for Grain Movement, page 10 of this study.

AVAILABLE GRAIN CAR SUPPLY

The U.S. covered hopper fleet totaled 236,000 cars as of January 1, 1978 (table 5). During the calendar year 1977, nearly 6,000 cars were added to the covered hopper fleet. From January 1, 1972, through the same date in 1978, about 56,000 cars, a 31.3 percent increase, were added to this fleet. This is an average addition of well over 9,000 cars per year during this 6 year period.

Table 5--U.S. covered hopper car ownership and yearly additions, 1972-78

Year*	Class I railroads	Class II railroads	Private shippers	Total cars in fleet	Added to fleet
1978	159,766	2,960	73,103	235,829	
1977	158,850	1,074	70,145	230,069	5,760
1976	156,850	1,386	70,029	228,265	1,804
1975	154,302	979	64,081	219,362	8,903
1974	150,499	656	53,771	204,926	14,436
1973	141,672	637	43,910	186,218	18,708
1972	138,099	731	41,045	179,675	6,543

Source: Association of American Railroads, CS-54A, Reports for Respective year.

*Year beginning January 1.

During recent years, the demand for covered hopper cars has expanded rapidly. Not only is grain transportation demanding more covered hoppers, but fertilizers, minerals, chemicals, and plastic are also strongly competing for these cars. During the year 1977, only 67,000 covered hopper cars, or 30.6 percent of the total fleet, were allocated to grain hauling. The remaining hopper cars were allocated to other bulk commodities.^{1/}

^{1/} These figures are computed from Association of American Railroads, 1977, Annual Equipment Loading Report, CS54-1B, data, and information in tables 4 and 6.

As recently as 1960, virtually all railroad hauled grain was in ND boxcars.^{2/} However, by 1972, boxcars accounted for only 38.2 percent of the total grain volume moved by rail and 48.1 percent of the total grain carloadings (table 6). These hopper cars accounted for the rest. By 1977, the larger hopper cars were hauling 87.5 percent of the total grain volume with 80.5 percent of the car loadings. Hoppers carry about one-third more volume than boxcars, hence, require fewer cars to move equal quantities.

Table 6--Percentage of grain hauled and volume by car type

Year	Grain car loading		Volume	
	Covered hopper : ND boxcar		Covered hopper : ND boxcar	
Percent				
1972	51.9	48.1	61.8	38.2
1973	48.7	51.3	58.7	41.3
1974	62.7	37.3	74.1	25.9
1975	73.6	26.4	82.6	17.4
1976	78.6	21.4	86.2	13.8
1977	80.5	19.5	87.5	12.5

Source: Association of American Railroads

About 73,000 cars, or 31 percent of the covered hopper fleet, were in private ownership as of January 1, 1978 (table 5). Private ownership saves the railroads a substantial financial investment.

A look at owners of large covered hoppers (4,000 cu. ft. capacity and over) shows private ownership with over 55,000 cars, or 58 percent of the total U.S. large covered hopper fleet, as of April 1, 1978. The large hoppers are the cars most often used for hauling grains.

The boxcar fleet totaled 189,506 cars as of January 1, 1972, (table 7). By 1978, the total fell to 86,081 cars, a decline of 103,425 cars, or 54.6 percent of the total fleet, during a 6 year period. From January 1, to April 1, 1978, nearly 8,000 boxcars were retired. This declining trend will certainly leave few ND boxcars for grain hauling by the year 1985. Also, most of the remaining ND boxcars will have reached the mandatory retirement age limit long before 1985. The Association of American Railroads' car hire

^{2/} ND boxcar refers to the 40-foot narrow-door boxcar which was the "workhorse" of the grain car fleet.

rules prohibit the interlining of cars between railroads after reaching 43 years of age.

Table 7--U.S. narrow-door boxcar ownership and yearly removals, 1972-78

Year	Total cars in fleet	Removed from fleet
1978	78,294	
1978*	86,081	7,787 - 3 months
1977**	107,269	23,866
1976	131,135	18,453
1975	148,119	16,984
1974	163,895	15,776
1973	172,508	8,613
1972	189,506	16,998

Source: Association of American Railroads

* From January 1 through April 1, a 3-month period

** Year beginning January 1

RAILCAR SHORTAGE FOR GRAINS

Covered hopper car shortages began after the corn and soybean harvest in 1977. Unusual cold and snowstorms hampered rail operations during the 1977/78 winter, adding to car shortages. Also, locomotive shortages and unserviceable cars added to this dilemma.

By the end of January 1978, covered hopper shortages reached nearly 12,000 per day. And, at the end of February, car shortages averaged nearly 21,000 per day. This was well above the 1973 peak of about 16,000 a day brought on by the heavy grain shipments to the Soviet Union.

A strengthening export market for grains pushed the demand for covered hoppers during the month of March. Farmers holding grains for better prices began selling again during this time. By April 1, 1978, the covered hopper car shortage averaged over 33,000 cars per day.

The car shortage figures discussed above should not be regarded as absolute shortage numbers, as they are somewhat inflated because of duplicate ordering. Nevertheless, the hopper shortage figures are an indication of the increased demand for grain cars during this period.

One of the many reasons for railcar shortages is the great reduction in railroad-owned, 40-foot ND boxcars. Once the mainstay of rail grain movement, these cars have become nearly out-moded by the jumbo covered hopper cars which allow greater efficiency, due to their larger capacity and faster unloading characteristics. Nevertheless, in recent years the ND boxcar has served as an important supplement to the jumbo hoppers. These boxcars are particularly important as a backup when the hoppers are not available. They are also needed where the track will not support the weight of the larger hoppers and where the shipper's facilities will not accommodate hopper cars.

The railroads are gradually increasing the ownership of jumbo hopper cars which provides some increase in capacity; however, this gain is more than offset by the rapid reduction in the ownership of ND boxcars.

With future demand for grain movements projected at substantially higher levels, more covered hopper cars coupled with greatly improved car use will be required to prevent the car shortage situation from worsening.

RAILCARS REQUIRED FOR GRAIN MOVEMENT

The number of railcars required for grain movement in 1985 is speculative. However, estimates based upon Economics, Statistics, and Cooperatives Service projections show that substantially more grain will be moved by rail in 1985, 1990, and the year 2000, than during the 1977/78 marketing year, when severe car shortages existed (table 8).

It is reasonably certain that nearly all rail-hauled grains will be moving in covered hoppers by 1985, with only a few ND boxcars existing for this purpose.

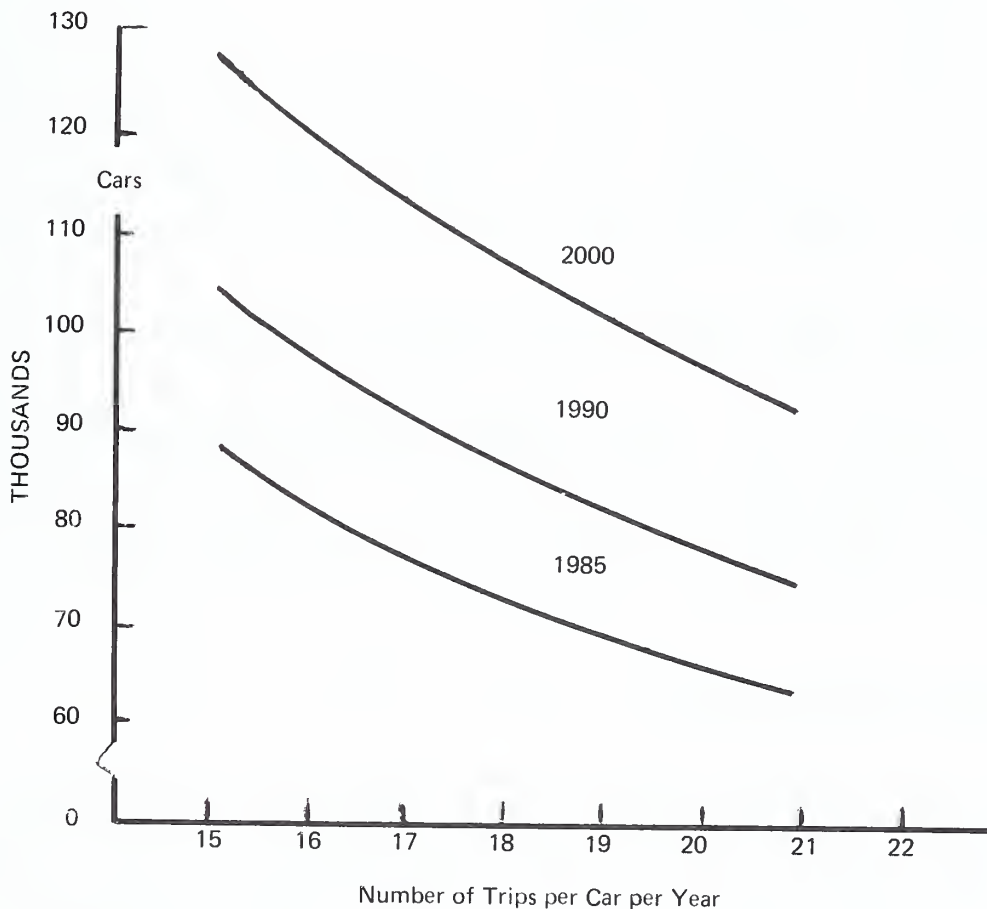
Table 8--Covered hopper cars required for current U.S. grain movements

	1975/76	1976/77	1977/78
Total covered hopper carloads	990,693	1,038,445	1,079,606
Number of trips per year (actual)	15.2	15.7	15.2
Covered hopper cars required	65,177	66,143	71,027

Source: Ton data from table 3 adjusted by table 6 data and divided by 96 tons per car.

If railroads maintain their present modal share of off-farm grain movements, the estimated grain transportation demand for 1985 indicates that approximately 17,000 additional covered hoppers over the 1977/78 marketing year will be required (figure 1 and table 8). The required total will be approximately 88,000 cars by 1985.

Figure 1. COVERED HOPPER CAR REQUIREMENTS FOR GRAIN MOVEMENT YEARS 1985, 1990, AND 2000



This projection is based upon the assumption that covered hoppers will average 15 trips per year, the Scenario I level. By 1990, some 105,000 covered hoppers, or an additional 34,000 cars will be required to move U.S. grain and 130,000 by the year 2000, up about 58,000 over current levels based upon Scenario I utilization.

However, if railroads improved covered hopper trips to 16 per year, Scenario II level is possible by 1985. Then only about 12,000 additional cars will be required to move grains in 1985, 27,000 by 1990, and an additional 50,000 by the year 2000, over the 1977/78 marketing year levels.

Taking an extremely optimistic outlook, assume that the railroad industry will alleviate some of their major problems and improve hopper utilization to 20 trips per year by 1985. Then only about 66,000 covered hoppers will be required to move grains in 1985. This is about 5,000 less covered hoppers than would have been required to move grain during the 1977/78 marketing year. About 78,000 hoppers will be required to move grains by rail by 1990 and 97,000 by the year 2000 at the Scenario VI level. Improving car trips will require fewer covered hoppers in the future to move the expanding grain movements. Fewer hoppers purchased means smaller capital investment for equipment.

CAPITAL INVESTMENT FOR COVERED HOPPERS

The financing of equipment is a major railroad problem. Many railroads find paying per diem more advantageous than owning rail cars themselves. Ability to increase car supply is directly related to earnings. Many railroads in grain producing regions are no longer financially viable and cannot afford the larger capital investments necessary for the purchase or leasing of numerous covered hoppers.

Today, large covered hoppers (100-ton capacity) cost about \$36,000, or twice the 1971 covered hopper car cost of about \$18,000.^{3/}

At the Scenario I level, 17,000 additional covered hoppers are needed to meet grains transportation demand by 1985. This increased requires an investment of \$612 million at 1978 car cost levels. This estimate assumes current covered hopper cost of \$36,000; however, it does not consider the future value of the dollar. If inflated car cost and future value are considered, the covered hopper investment will be considerably higher by 1985.

Because of rapidly inflated car costs, no estimate of capital needs are made for 1990 and the year 2000.

However, if railroads improve trip performance to 20, the Scenario VI level, then about 5,000 fewer hoppers will be required over 1977-78 grain movement levels to meet 1985 grain transportation demands. This projection disregards the additional hoppers required to replace retired cars. Clearly, railroads will benefit most by initiating an all-out effort for improving car use. More efficient use can reduce the need for large financial outlay and insure a better return on investment.

^{3/} Association of American Railroads, Car Service Division (unpublished material).

SUMMARY AND CONCLUSION

U.S. grain transportation demand is expected to increase in future years because of projected increases in domestic and export movements. Railroads must plan now for future increases in grain traffic. Inadequate car supply and inefficient use currently hamper grain hauling operations.

Improved car performance will reduce the number of cars required to meet the projected increased transportation demands for grains. Car performance levels are associated with specific operational cost levels which are essentially controlled by management decisions. This study provides railroads management with estimates of the number of covered hopper cars required to move grain during the years 1985, 1990, and 2000 at selected car performance levels.

If railroads improve performance to 20 trips per year, some 5,000 fewer hopper cars will be required by 1985 than during the 1977/78 marketing year. At this performance level only about 8,000 additional cars will be required by 1990, and about 16,000 by the year 2000. However, should present levels of covered hopper car use continue (about 15 trips per year), some 17,000 additional cars will be required to move the expected 12 million ton increase in railroads' share of the 1985 grain movement. About 34,000 additional cars will be required by 1990 to meet the increased transportation demand for grains and 58,000 by the year 2000.

APPENDIX -- METHODOLOGY AND ASSUMPTIONS

The National Economic Analysis Division, Economics, Statistics, and Cooperatives Service (ESCS), U.S. Department of Agriculture, makes long-range projections for grain production and exports for the years 1985, 1990, and 2000. This study incorporates ESCS's moderate or baseline projections for grain production and exports in determining future covered hopper needs.

A large amount of grain production requires no transportation because it is stored to be fed or used as seed on the producing farm. ESCS publishes an annual bulletin, called "Field Crops," which shows the amount of grains sold off farms for respective years. Current "Field Crops" information shows that 95 percent of the food grains, 98 percent of the soybeans, and 65 percent of the feed grains were sold off the farm. Because of the large proportion of food grains and soybeans currently moving off the farm, it is assumed that this percentage variable will remain unchanged for the future year projections in this study. These percentage variables are used to adjust ESCS's projected production figures to include only the food grains and soybeans moving off farms.

Because of increasing U.S. grain exports during the past decade, the amount of feed grains sold off farms has been growing. Further analysis by an ESCS grain analyst indicates that feed grain off-farm sales will reach 70 percent by 1985, 72 percent by 1990, and 75 percent by the year 2000. These percentages variables were used to adjust ESCS's feed grain production projections.

In determining railroads' modal share, grain carloads originated were compared to off-farm sales for respective grains. The Interstate Commerce Commission (ICC) publishes an annual report titled, "Freight Commodity Statistics, Class I Railroads," showing grain car originations in the United States.

Grains moving on rail sometimes go into storage and/or milling, and subsequently are reshipped (reoriginated) under transit billing and moved to market destinations. ICC's transport statistics included reoriginated grain carloads. Therefore, the statistics were adjusted to exclude reshipments to determine rail's modal share of off-farm sales.

The U. S. Department of Transportation (DOT) provides a 1 percent waybill sample showing re-originated grain cars on a yearly basis. The DOT sample data was used to remove duplication from ICC's statistics on carload originations. Railroads' modal share of off-farm sales was 62.8 percent for food grains, 37.2 percent for feed grains, and 23.2 percent for soybeans.

Railroads' modal share of grain traffic has declined during recent years. It is possible, however, that petroleum scarcity by 1985, could result in grain traffic shifting back to rail transportation. However, poor rail service and higher freight rates could offset railroads' potential

gains from fuel efficiency. Because solid information concerning future rail operations, and petroleum scarcity is not currently available, it is assumed that railroads' current modal share of grain movements will remain unchanged during the years 1985, 1990, and 2000.

Railroads' modal share percentage was applied to off-farm sales projections for 1985, 1990, and 2000 to determine future covered hopper needs. However, in determining grain's total transportation demand for covered hoppers, the current percentage of cars reoriginated (12.9 percent, a 4-year weighted average, 1972-75) was included with railroads' modal share for the years 1985, 1990, and 2000.

In 1977, covered hopper cars averaged about 96 tons per car for all types of grains moving on rail and ND boxcars averaged about 60 tons. It is assumed that average loads in covered hoppers will not change substantially through the year 2000. This is because of weight restrictions on many tracks in grain producing regions and recent evidence that 100-ton loads in covered hoppers are causing severe damage to rail track and ties, particularly during high-speed movements.

Another assumption in this study is that 95 percent of grain volume on rail will be moving in covered hopper cars by 1985, and virtually all grain thereafter. This is because most of the remaining ND boxcars are old and are being retired rapidly.

The car needs derived in this study should not be considered static. If conditions indicate that assumptions in this study should change in future years, new information can be substituted in the computations to determine covered hopper requirements. Determining covered hopper needs should be a continuing study reflecting future changes.

